PA-300
PREAMPLIFIERS
Operating Instructions

TELEDYNE
JUDSON TECHNOLOGIES
A Teledyne Technologies Company

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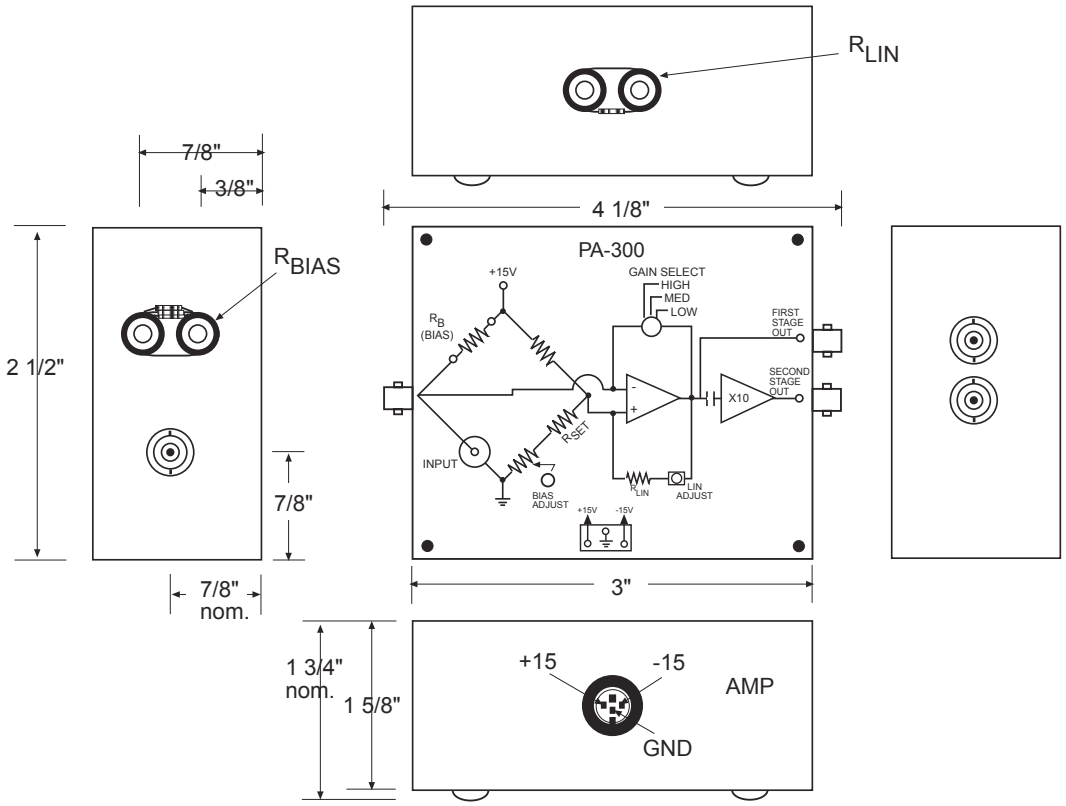


Specifications

Bandwidth: First Stage - DC to 1.0MHz
Second Stage - 200Hz to 100KHz, AC coupled
Gain: First Stage(V/A) - 100(LO), 300(MED), 1000(HI)
Second Stage - x10
Noise Density (NV/ Hz): 1.5
Output Impedance: - 100
Maximum Output Voltage: ± 10V P-P
Power Requirements: ± 15V DC @ 200mA
Bias Voltage (internally supplied): +15V
Size: 2 1/2" x 4 1/8" x 1 3/4"
Power Connector: 3 pin circular miniature DIN

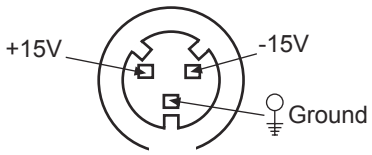
Description

Teledyne Judson's PA-300 DC-coupled preamplifiers are designed for operation with photoconductive HgCdTe detectors. The preamps offer low noise, adjustable gain, DC offset compensation and a linearizing network. The PA-300 applies a constant bias voltage V_B across the detectorto produce a current signal.

$$i_{signal} = \frac{V_B}{R_D}$$

Power Requirements

The PA-300 comes with a miniature DIN connector and is connected as follows.



The PA-300 is supplied with a cable where

Wire	Power
red	+15
black	-15
green	ground

Because the main power supply also provides the detector bias, a low-noise power supply is critical. Any fluctuations in the bias will appear as detector noise. **Batteries are strongly recommended.** A *well-filtered* power supply may also be used.

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Detector Biasing
When purchased with a J15 Series HgCdTe detector, the preamplifier is supplied with a bias resistor to provide optimum bias voltage to the detector.

If the amplifier was purchased without the detector, the amplifier should be matched to the detector in the following manner:

1. Remove the linearizing resistor if applicable.

2. The factory installed set resistor is 207 ohms (nominal) for a 1mm square detector and bias of 1.2VDC. The value of the set resistor can be determined by using Table 1.0 or the following formula.

$$R_{set} = 2210\, V_{Bias} / (V_{Supply} - V_{Bias} - 0.7)$$

When installing R_{set} and R_{lin} on customer supplied detectors, use the following table to select R_{set} and R_{lin}. Use 1% resistors.

Det. Size (PC MCT)	Nominal V_{Bias}	R_{set}
.10	.125	19.0
.25	.30	47
.50	.60	97
1.0	1.2	200
2.0	2.4	450
3.0	3.6	750
4.0	4.3	1100

Table 1.0

The voltage bias set resistor R_{set} should be installed in the amplifier. This is done by removing the top cover and de-soldering the R_{set} resistor. This resistor is mounted on solder clips for ease of replacement.

The detector bias voltage is set with the bias resistor R_B and detector disconnected. Set detector bias voltage to values indicated on detector data sheet by adjusting bias pot while monitoring the voltage at the first stage output BNC.

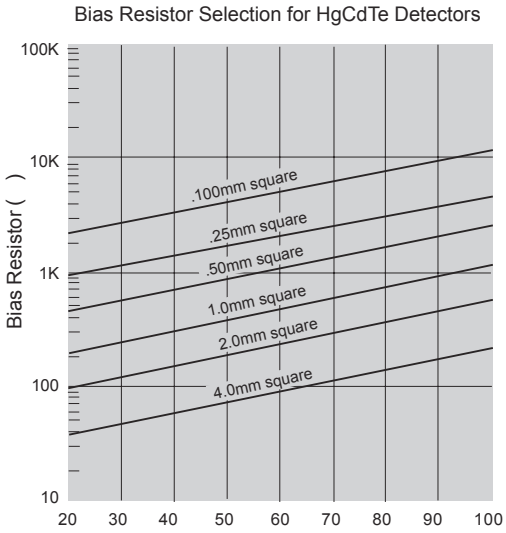

Table 2.0

3. The bias resistor (R_B) is selected to balance the bridge network and must be selected to provide all of the current to the detector. The value of R_B can be calculated using the following formula or Table 2.0.

$$R_B = (V_{Supply} - V_{Bias} - 0.7)\ R_{Detector} / V_{Bias}$$

Choose the closest 1% metal film resistor value for the bias resistor with a power rating > $(V_{supply} - V_{Bias} - 0.7)^2 / R_B$. If bias power is over 0.25 watts, use either higher power resistors or parallel two resistors of double the value.

Connect the bias resistor to the external pin jacks on the amp. Cool the detector to its operating temperature and connect it to the amplifier input. Select high gain setting and verify first stage output voltage < 1V. If greater than 1V, adjust R_B closer to calculated values until first stage output voltage < 1V. Final adjustments in first stage output offset voltage to 0V can be made by adjusting bias pot if necessary.

If the detector is used with high optical power levels such as in an FTIR application, this adjustment should be made with the unit in the system.

Installing the Linearizing Resistor
The optional linearizing resistor should be used as necessary to bring the spectral response curve baseline back to a zero level. The value of this resistor required should be between 2Kohms and 20Kohms. The linearity adjust potentiometer can be used for fine adjustments.

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